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Microcomputer-Based Software for Management of Calibration Service

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
National Engineering Laboratory
Center for Electronics and Electrical Engineering
Electrosystems Division
Washington, DC 20234

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MICROCOMPUTER-BASED SOFTWARE FOR MANAGEMENT OF CALIBRATION SERVICE

William E. Anderson

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MICROCOMPUTER-BASED SOFTWARE FOR MANAGEMENT OF CALIBRATION SERVICE

William E. Anderson

Abstract

The majority of the calibration customers' concerns are directed not to the technical details of the calibration service but to the timely delivery of that service. It is therefore proper that the calibration services be closely managed. For a Group or Division with a large calibration load, this can be a difficult task. The Applied Electrical Measurements Group of the Electrosystems Division has developed microcomputer-based software to provide considerable assistance to the calibration manager. With this database software, complete information on the status of all the calibration jobs is instantly available.

Key words: calibration management; calibrations; database management; microcomputer; software

1. INTRODUCTION

In order to provide adequate service to calibration clients, good management must be exercised at the Group and/or Division level. Most complaints concerning a calibration service are not directed to the technical aspects of the service but more often to the timely delivery of the service. Therefore, it would be of considerable value if complete information as to the status of each calibration job were instantly accessible.

In the past, the Applied Electrical Measurements Group of the Electrosystems Division kept a calibration log book. The arrival of purchase orders, test folders, and equipment prompted an entry into the log book. Also entered were the device type, closing date and fees. While most of the information necessary to maintain a calibration service was contained in the log, retrieval of the information in real time was not always possible. The requests for additional fiscal and statistical information (e.g., the income per quarter from a specific calibration service), sometimes required excessive amount of time for response.

With the advent of microprocessor-based workstations and commercially available database software, vast improvements could be made in providing the information without a significant expenditure in resources. Such a system was developed in the Electrosystems Division and has been in use for the past six months. The system has been able to meet all demands on it and also has served as a means for checking the accuracy of the centralized accounting system. Further, the availability of accurate information on the current financial status of the calibration service permits better planning decisions to be made.

2. DESCRIPTION OF SOFTWARE

Relational database software is readily available for both 8 and 16-bit microcomputers. The database management system, dBase II [1], from Ashton-Tate was selected because it was the only such software available at that time which

could be used on all the computers anticipated to be used by the Group. A similar calibration management program could be designed using database management software from other vendors.

While dBase II provides the command structure to create and manipulate databases, the user must provide the programs (in dBase II's language) to tailor the software to the user's needs. (A listing of the various programs along with sample output is provided in the appendix). In order to make it possible for this calibration management software to be used without any knowledge of dBase II, the software was written to be menu-driven. Assuming the operator has turned on the computer, loaded in the operating system, and that the programs and database reside on the default disk drive, entering 'dbase menu' should provide the following onscreen menu:

```
                    NUMBER OF RECORDS IS ---

                      CALIBRATION FILE MENU

                      0 - EXIT
                      1 - ENTER NEW RECORD
                      2 - AMEND OR CHECK CONTENTS OF DATABASE RECORD
                      3 - PRINT LIMITED
                      4 - PRINT ALL
                      5 - PRINT ACTIVE
                      6 - PRINT LATE JOBS
                      7 - PRINT BY DEVICE
                      8 - PRINT BY CUSTOMER
                      9 - DISPLAY ACTIVE
                      A - COPY DATABASE

          ENTER DESIRED ACTION

WAITING
```

Menu choices '1' and '2' provide the user a method for changing the contents of a database record. The program is designed in such a way that each record corresponds to one instrument received for calibration. (For multiple instruments attached to the same test folder, suffixes A,B,C, etc. are concatenated to the test number). Each record consists of the following fourteen fields: test number, purchase order number, type of instrument, model name and number, serial number, staff member assigned to calibration, customer's name, customer's city and state (and zip code), starting date for job, promised date, finishing date, form letter information, number of manhours, and cost (excluding OPMS surcharges). While the contents of most of these fields may be apparent, the intended contents of the form letter information field may need explaining. It is the policy of the Electrosystems Division to keep its customers informed as to the status of their calibration job with the use of form letters. For example, if a purchase order is received with no instrument, the customer is so notified. The customer always receives at least one form letter with the estimated cost of the calibration and the date the job should be finished. The form letter information field is 50 characters wide, permitting the entry of the dates the form letters have been sent out and, if necessary, a one or two letter code describing the form letter contents. The menu choices allow either modification of the database or output of information contained in the database to the user. Each of the choices is explained below.

0 - EXIT Menu choice '0' causes the program to terminate and exit to the operating system (DOS or CPM). It is important that the user select this choice before removing the diskettes or turning off the computer as this selection also guarantees that the actual database file is properly updated from memory.

1 - ENTER NEW RECORD Menu choice '1' allows the user to enter initial information concerning a calibration job. The user is prompted on each data entry. The day's date is automatically entered as the job start data. In the cases where the test number is not known, a temporary number should be assigned in order to facilitate fast retrieval of the record.

2 - AMEND OR CHECK CONTENTS OF DATABASE RECORD Menu choice '2' allows the user to observe or update the information in the database as the work progresses. If the user selects menu choice '2', the user will be prompted to give either the test number or purchase order number of the record to be updated or checked. Since the database is indexed on test numbers, a typical search for a test number takes less than 2 seconds.

3 - PRINT LIMITED Menu choice '3' provides the user a means of getting a partial listing on the system printer of the database contents. The fields printed are the test number, type of instrument, customer name, job closing date, and cost. The total cost or income is also listed. The listing is in order of test numbers.

4 - PRINT ALL Menu choice '4' results in a more complete listing of the database contents than choice '3.' Specifically all the fields are printed out except the purchase order, staff member, and form letter information fields. The information is printed in compressed print (132 characters per line on the IBM printer). The total cost or income along with the manhours are also listed. Users can get hardcopy access to the three missing fields by exercising choice '2' and a print screen command if their computer supports it.

5 - PRINT ACTIVE Menu choice '5' permits the user to receive a hardcopy listing of all the active jobs. Basically the database is searched for all records without a closing date entry. This enables the user to check the active jobs against the OPMS monthly statement of active jobs.

6 - PRINT LATE JOBS Menu choice '6' causes the database to be searched for all records in which the promised date comes before the present date and there is no closing date entry. These jobs demand immediate attention, normally in the form of a letter to the customers informing them of a revised promised date.

7 - PRINT BY DEVICE Menu choice '7' provides the user with a hardcopy summary of all the jobs to date of a particular type of instrument (e.g., voltage transformers). The summary also includes the total income earned for that type of instrument and the calibration manhours expended.

8 - PRINT BY CUSTOMER Menu choice '8' yields a hardcopy listing of the jobs done or in progress for a particular customer. The total cost to that customer is also presented. If a customer calls concerning a calibration, this command may be the quickest way to find the corresponding record if the test or purchase order number are not available.

9 - DISPLAY ACTIVE Menu choice '9' is identical to choice '5' except the output is to the display screen and not the printer.

A - COPY DATABASE Menu choice 'A' permits the user to copy the database onto another floppy diskette to serve as backup. It is assumed that the default drive is the "A" drive and contains the database programs and the database. A formatted diskette must be placed in drive "B" before selecting this menu choice. Experience has shown two problems with this menu choice. The first is that the duplication process is relatively slow in dBase II. The second is that if an error occurs during the duplication process, one often ends up in the operating system. This could result in the database not being updated since a proper exit from dBase II has not taken place. This command has been left on the display screen as a reminder to the user to backup the database. The best way to do this, however, is exiting via menu choice '0' and copying the database file in the operating system, using operating system commands.

The above choices represent only a small fraction of the useful information contained in the database. Unfortunately, the more choices presented on the menu, the more cluttered the screen becomes. A programmer with some familiarity with dBase II can extract a myriad of useful information from the database. For example, if there is a need to know the number and income derived from watthour standards calibrated in the third quarter from state governments, that information can be extracted readily from the database. Also, it is possible to modify the menu choices to better meet the needs of a particular group of users.

The software system described has a great amount of flexibility. If it becomes apparent that additional fields of information need to be saved in the database, they can be added. For example, in the future it may be important to keep track of when and if an instrument has been calibrated by the National Bureau of Standards previously. Also, field sizes can be modified. If it is found that 50 characters do not provide enough space to accommodate the form letter information, the field can be expanded. The information contained in the database can be communicated to files used by word processors or to other computers. The software is portable in the sense that although it was developed on the IBM PC [1], it runs perfectly on the 8-bit storeroom microcomputer after modification of three program lines.

[1] Certain commercial hardware and software are identified in this report in order to specify the procedure used to manage the calibration data. Such identification does not imply recommendation or endorsement by the National Bureau of Standards nor does it imply that the items identified are necessarily the best available for the purpose.

3. SUMMARY

We have developed a microcomputer-based software system for the management of a calibration service at the Group or Division level. The system has been designed for user "friendliness." A Group secretary has demonstrated total success in using the software. The software has provided Group and Division management with information on the status of calibrations far superior to that currently available from other sources. It has allowed the Group to make better estimates of the financial status concerning our calibration services. In fact, it is a likely case that this software itself has justified the investments the Group has made in the procurement of the microprocessor workstations.

APPENDIX A

The microcomputer-based software for the management of a calibration service is presented. The software was written to be used on an IBM PC or XT using dBase II version 2.4. A slight modification will be presented that enables the software to be run on the 8-bit storeroom microcomputer. Comments are not encouraged in dBase II in the sense that they must be on a separate program line. Variable names have been chosen, however, that should help in understanding the programs.

Listing A is the program entitled 'menu.' It can be run from the operating system by typing 'dbase menu' or from dBase II by typing 'do menu.' This program causes the menu shown in display A to appear on the screen. Users not having a color monitor and users of the 8-bit storeroom microcomputer should delete the second line (SET COLOR TO 4.2). The database in this listing has the file name CALFY83. The software is designed so that a new database should be used each fiscal year.

Selection of menu choice '1' causes the program 'NEWRCD' (listing B) to be called. Display B shows the resulting screen display. The user is prompted for each of the possible fields of data entry.

Selection of menu choice '2' calls the program 'AMERCD' (listing C). The user is requested to enter either the test number or purchase order number so the software can find the record to be modified or checked. The resulting display is shown in display C.

Selection of menu choice '3' calls the program 'PRINTLIM' (listing D). This listing also includes the report format to be used for the printout. (M=1 sets the lefthand margin, N results in no page heading, N results in a single-spaced report, Y allows numerical totalling, and N disallows subtotalling). A page of the resulting printout is shown in printout D.

Selection of menu choice '4' calls the program 'PRINTALL' (listing E). The second line of the program tells the IBM printer to use compressed type. For the Prism printer used with the storeroom microcomputer, this line should be changed from 'chr(15)' to 'chr(31).' A page of the resulting printout is shown in printout E.

Selection of menu choice '5' calls the program 'PRINTACT' (listing F). A sample of the printout is shown in printout F.

Selection of menu choice '6' calls the program 'PRINTDEL' (listing G). A sample of the printout is shown in printout G.

Selection of menu choice '7' calls the program 'PRINTDEV' (listing H). The user is prompted to enter the type of calibration instrument. A sample of the printout is shown in printout H.

Selection of menu choice '7' calls for the program 'PRINTCUS' (listing I). The user is prompted to enter the customer's name. The second line of the program tells the IBM printer to use compressed type. For the Prism printer used with the storeroom microcomputer, this line should be changed from 'chr(15)' to 'chr(31).' A sample of the printout is shown in printout I.

Selection of menu choice '9' calls the program 'DISPACT' (listing J). This menu choice is identical to choice '5' except the output is to the screen and not the printer. The report format for this program 'PRINTACT' is shown in listing F.

Selection of menu choice 'A' calls the program 'DUP' (listing K). As mentioned in the main text, this command should only be used on a machine known to have two well-running disk drives.

LISTING A

MENU

```
SET COLOR TO 4,2
ERASE
DO WHILE TRUE
USE CALFY83
GO BOTTOM
ERASE
?
? '                                    NUMBER OF RECORDS IS', #
USE
USE CALFY83 INDEX TESTNO
?
? '                                    CALIBRATION FILE MENU'
?
? '                                         0 - EXIT'
? '                                         1 - ENTER NEW RECORD'
? '                                         2 - AMEND OR CHECK CONTENTS OF
DATABASE RECORD'
? '                                         3 - PRINT LIMITED'
? '                                         4 - PRINT ALL'
? '                                         5 - PRINT ACTIVE'
? '                                         6 - PRINT LATE JOBS'
? '                                         7 - PRINT BY DEVICE'
? '                                         8 - PRINT BY CUSTOMER'
? '                                         9 - DISPLAY ACTIVE'
? '                                         A - COPY DATABASE'
?
? '                                    ENTERED DESIRED ACTION'
WAIT TO ACTION
DO CASE
   CASE ACTION='0'
      SET TALK ON
      QUIT
   CASE ACTION='1'
      DO NEWRCD
   CASE ACTION='2'
      DO AMERCD
   CASE ACTION='3'
      DO PRINTLIM
   CASE ACTION='4'
      DO PRINTALL
   CASE ACTION='5'
      DO PRINTACT
   CASE ACTION='6'
      DO PRINTDEL
   CASE ACTION='7'
      DO PRINTDEV
   CASE ACTION='8'
      DO PRINTCUS
   CASE ACTION='9'
      DO DISPACT
```

```
   CASE ACTION='A'
      DO DUP
   OTHERWISE
      ? ' INVALID ENTRY, RE-ENTER'
ENDCASE
ENDDO
RETURN
```

DISPLAY A

NUMBER OF RECORDS IS 169

CALIBRATION FILE MENU

0 - EXIT
1 - ENTER NEW RECORD
2 - AMEND OR CHECK CONTENTS OF DATABASE RECORD
3 - PRINT LIMITED
4 - PRINT ALL
5 - PRINT ACTIVE
6 - PRINT LATE JOBS
7 - PRINT BY DEVICE
8 - PRINT BY CUSTOMER
9 - DISPLAY ACTIVE
A - COPY DATABASE

ENTER DESIRED ACTION

WAITING

LISTING B

NEWRCD

```
ERASE
GO BOTTOM
STORE 'Y' TO X
DO WHILE X='Y'
ERASE
STORE DATE() TO M:DATESTAR
STORE '0 /  /  ' TO M:DATEPROM
STORE '  /  /  ' TO M:DATECLOS
STORE '        ' TO M:TEST:NO
STORE '                ' TO M:PO:NO
STORE '                    ' TO M:TYPE
STORE '                                ' TO M:MODEL
STORE '             ' TO M:SERIALNO
STORE '                                ' TO M:CUSTNAM
STORE '                                ' TO M:LOCATION
STORE '             ' TO M:STAFF
STORE '                                                                '
TO M:FORMLET
STORE 0 TO M:MANHOURS
STORE 0 TO M:COST
@ 2,0 SAY "TODAY'S DATE" GET M:DATESTAR PICTURE '99/99/99'
@ 3,0 SAY 'TEST NUMBER' GET M:TEST:NO
@ 3,0 SAY 'PURCHASE ORDER NUMBER' GET M:PO:NO
@ 5,0 SAY 'TYPE CHOICES ARE; MAP,WATTHOUR STANDARD,CURRENT TRANSFORMER,'
@ 6,0 SAY 'VOLTAGE TRANSFORMER,DC DIVIDER,AC DIVIDER,XRAY DIVIDER, DC & AC'
@ 7,0 SAY 'DIVIDER,IMPULSE DIVIDER,VT COMPARATOR,OR CT COMPARATOR' GET M:TYPE
@ 8,0 SAY 'INSTRUMENT MODEL' GET M:MODEL
@ 9,0 SAY 'INSTRUMENT SERIAL NUMBER' GET M:SERIALNO
@ 10,0 SAY 'CUSTOMER NAME' GET M:CUSTNAM
@ 11,0 SAY 'CUSTOMER LOCATION' GET M:LOCATION
@ 12,0 SAY 'CALIBRATION STAFF MEMBER' GET M:STAFF
@ 13,0 SAY 'DATE PROMISED' GET M:DATEPROM PICTURE '99/99/99'
@ 14,0 SAY 'FORM LETTER INFO' GET M:FORMLET
@ 15,0 SAY 'CLOSING DATE' GET M:DATECLOS PICTURE '99/99/99'
@ 16,0 SAY 'COST EXCLUDING OMS SURCHARGE' GET M:COST PICTURE '######.##'
@ 17,0 SAY 'CALIBRATION MANHOURS' GET M:MANHOURS PICTURE '#####.##'
READ
APPEND BLANK
REPLACE TEST:NO WITH M:TEST:NO,TYPE WITH !(M:TYPE),MODEL WITH !(M:MODEL)
REPLACE SERIALNO WITH !(M:SERIALNO),STAFF WITH !(M:STAFF)
REPLACE LOCATION WITH !(M:LOCATION),DATESTAR WITH M:DATESTAR
REPLACE FORMLET WITH !(M:FORMLET),DATECLOS WITH M:DATECLOS
REPLACE COST WITH M:COST,MANHOURS WITH M:MANHOURS,DATEPROM WITH M:DATEPROM
REPLACE PO:NO WITH !(M:PO:NO),CUSTNAM WITH !(M:CUSTNAM)
ACCEPT 'WANT TO CONTINUE 'Y' OR 'N'" TO X1
STORE !(X1) TO X
ENDDO
RETURN
```

```
DISPLAY B

TODAY'S DATE; 12/15/83:
TEST NUMBER:        :
PURCHASE ORDER NUMBER:                :
TYPE CHOICES ARE: MAP,WATTHOUR STANDARD,CURRENT TRANSFORMER, CAPACITOR,
VOLTAGE TRANSFORMER,DC DIVIDER,AC DIVIDER, XRAY DIVIDER, DC & AC
DIVIDER,IMPULSE DIVIDER,VT COMPARATOR,OR CT COMPARATOR:                          :
INSTRUMENT MODEL:                                  :
INSTRUMENT SERIAL NUMBER:          :
CUSTOMER NAME:                           :
CUSTOMER LOCATION:                              :
CALIBRATION STAFF MEMBER:          :
DATE PROMISED:0 /  /  :
FORM LETER INFO:                                          :
CLOSING DATE:  /  /  :
COST EXCLUDING OMS SURCHARGE:    0.00:
CALIBRATION MANHOURS:    0.00:
```

LISTING C

AMERCD

```
STORE 'Y' TO X
DO WHILE X='Y'
ERASE
STORE '          ' TO M:TEST:NO
STORE '                    ' TO M:PO:NO
ACCEPT "ENTER TEST NUMBER IF KNOWN OTHERWISE 'RETURN'" TO M:TEST:NO
IF M:TEST:NO=' '
   ACCEPT "ENTER PURCHASE ORDER NUMBER IF KNOWN OTHERWISE 'RETURN'" TO M:PO:NO
   IF M:PO:NO=' '
      RETURN
   ELSE
      LOCATE FOR !(M:PO:NO) $ PO:NO
   ENDIF
ELSE
   FIND &M:TEST:NO
ENDIF
IF (.NOT. EOF) .AND. (#<>0)
@ 5,0 SAY 'TEST NUMBER' GET TEST:NO
@ 6,0 SAY 'PURCHASE ORDER NUMBER' GET PO:NO
@ 7,0 SAY 'TYPE' GET TYPE
@ 8,0 SAY 'INSTRUMENT MODEL' GET MODEL
@ 9,0 SAY 'SERIAL NUMBER' GET SERIALNO
@ 10,0 SAY 'CUSTOMER NAME' GET CUSTNAM
@ 11,0 SAY 'CUSTOMER LOCATION' GET LOCATION
@ 12,0 SAY 'JOB START DATE' GET DATESTAR PICTURE '99/99/99'
@ 13,0 SAY 'DATE PROMISED' GET DATEPROM PICTURE '99/99/99'
@ 14,0 SAY 'FORM LETTER INFO' GET FORMLET
@ 15,0 SAY 'STAFF NAME' GET STAFF
@ 16,0 SAY 'CLOSING DATE' GET DATECLOS PICUTURE '99/99/99'
@ 17,0 SAY 'COST' GET COST PICTURE '######.##'
@ 18,0 SAY 'MANHOURS' GET MANHOURS PICTURE '#####.##'
@ 19,0
@ 20,0
ACCEPT "WANT TO MAKE CHANGES 'Y' OR 'N'" TO Y1
STORE !(Y1) TO Y
IF Y='Y'
   READ
ENDIF
ELSE
@ 21,0 SAY 'RECORD COULD NOT BE FOUND'
ENDIF
ACCEPT "WANT TO CHANGE OR OBSERVE ANOTHER RECORD 'Y' OR 'N'" TO X1
STORE !(X1) TO X
ENDDO
RETURN
```

```
DISPLAY C

ENTER TEST NUMBER IF KNOWN OTHERWISE 'RETURN':228554



TEST NUMBER:228554 :
PURCHASE ORDER NUMBER:                  :
TYPE:WATTHOUR STANDARD     :
INSTRUMENT MODEL: SCIENTIFIC COLUMBUS SC-60    :
SERIAL NUMBER:             :
CUSTOMER NAME:RFL INDUSTRIES               :
CUSTOMER LOCATION:BOONTON, NJ 07005              :
JOB START DATE:  /  /  :
DATE PROMISED:10/01/82:
FORM LETTER INFO:                                                    :
STAFF NAME:RAMBOZ    :
CLOSING DATE:10/01/82:
COST:   262.50:
MANHOURS:    0.00:


WANT TO MAKE CHANGES 'Y' OR 'N':
```

LISTING D

PRINTLIM

```
REPORT FORM PRINTLIM TO PRINT
RETURN
```

PRINTLIM.FRM

```
M=1
N
N
Y
N
7,TEST:NO

20,TYPE

30,CUSTNAM

8,DATECLOS

9,COST

Y
```

229944	CURRENT TRANSFORMER	LOCKHEED GEORGIA COMPANY	05/10/83	645.00
229948	WATTHOUR STANDARD	RFL INDUSTRIES	03/25/83	1016.00
230019	MAP	WEST TEXAS UTILITIES CO	04/15/83	485.00
230025	DC DIVIDER	GENERAL ELECTRIC	03/11/83	530.00
230121A	VOLTAGE TRANSFORMER	MILL-POWER SUPPLY COMPANY	03/25/83	3879.00
230121B	VOLTAGE TRANSFORMER	MILL-POWER SUPPLY COMPANY	03/25/83	0.00
230121C	VOLTAGE TRANSFORMER	MILL-POWER SUPPLY	03/01/83	0.00
230121D	VOLTAGE TRANSFORMER	MILL-POWER SUPPLY	03/01/83	0.00
230121E	VOLTAGE TRANSFORMER	MILL-POWER SUPPLY	03/01/83	0.00
230121F	VOLTAGE TRANSFORMER	MILL-POWER SUPPLY	03/01/83	0.00
230121G	WATTHOUR STANDARD	MILL-POWER SUPPLY	03/01/83	1250.00
230176	WATTHOUR STANDARD	DALLAS POWER & LIGHT	02/01/83	412.00
230180	WATTHOUR STANDARD	STATE OF MARYLAND	02/01/83	508.00
230181	WATTHOUR STANDARD	PHILADELPHIA ELECTRIC	02/01/83	781.00
230182	WATTHOUR STANDARD	RFL INDUSTRIES	03/01/83	898.00
230188	WATTHOUR STANDARD	TEXAS POWER & LIGHT	03/01/83	412.00
230193	WATTHOUR STANDARD	CENTRAL POWER & LIGHT	03/01/83	485.00
230198	WATTHOUR STANDARD	UNION ELECTRIC	03/01/83	664.00
230207	DC DIVIDER	SANDIA NATIONAL LABORATORIES	03/01/83	530.00
230219	WATTHOUR STANDARD	GENERAL ELECTRIC COMPANY	03/01/83	1288.00
230238	MAP	SOUTH CAROLINA ELECTRIC & GAS	03/01/83	641.00
230241	WATTHOUR STANDARD	TRANSDATA	03/01/83	1055.00
230254	WATTHOUR STANDARD	KOREAN STANDARDS RESEARCH INST	03/01/83	508.00
230261	CURRENT TRANSFORMER	RAYTHEON	03/01/83	785.00
230268	WATTHOUR STANDARD	THE UNIV. OF WISCONSIN-MADISON	03/01/83	485.00
230280	CURRENT TRANSFORMER	AVCO SYSTEMS DIVISION	03/01/83	704.00
230285A	WATTHOUR STANDARD	GULF POWER	03/01/83	2090.00
230285B	WATTHOUR STANDARD	GULF POWER	03/01/83	0.00
230285C	WATTHOUR STANDARD	GULF POWER	03/01/83	0.00
230308	WATTHOUR STANDARD	GENERAL ELECTRIC COMPANY	03/01/83	586.00
230345A	WATTHOUR STANDARD	PUBLIC SERVICE ELECTRIC & GAS	04/01/83	984.00
230345B	WATTHOUR STANDARD	PUBLIC SERVICE ELECTRIC & GAS	04/01/83	0.00
230435	DC DIVIDER	GENERAL ELECTRIC COMPANY	04/01/83	430.00
230455A	VT COMPARATOR	PACIFIC GAS & ELECTRIC	04/01/83	772.00
230455B	VOLTAGE TRANSFORMER	PACIFIC GAS & ELECTRIC	04/01/83	1799.00
230471	VOLTAGE TRANSFORMER	BOEING AEROSPACE COMPANY	04/01/83	851.00
230493A	VOLTAGE TRANSFORMER	GENERAL ELECTRIC COMPANY	04/01/83	1578.00
230493B	CAPACITOR	GENERAL ELECTRIC COMPANY	04/01/83	760.00
230493C	CAPACITOR	GENERAL ELECTRIC COMPANY	04/01/83	0.00
230493D	CAPACITOR	GENERAL ELECTRIC COMPANY	04/01/83	0.00
230497	WATTHOUR STANDARD	HOUSTON LIGHTING & POWER	04/01/83	1343.00
230506	WATTHOUR STANDARD	SCIENTIFIC COLUMBUS	04/01/83	820.00
230523	WATTHOUR STANDARD	VIRGINIA ELECTRIC & POWER	04/01/83	430.00
230530A	WATTHOUR STANDARD	GENERAL ELECTRIC COMPANY	05/01/83	3925.00
230530B	WATTHOUR STANDARD	GENERAL ELECTRIC COMPANY	05/01/83	0.00
230530C	WATTHOUR STANDARD	GENERAL ELECTRIC COMPANY	05/01/83	0.00
230538	WATTHOUR STANDARD	GENERAL ELECTRIC COMPANY	05/01/83	742.00
230584	WATTHOUR STANDARD	CORN BELT POWER CORP.	05/01/83	549.00
230589	WATTHOUR STANDARD	MCDONNELL DOUGLAS ASTRONAUTICS	05/01/83	634.00
230640	XRAY DIVIDER	TECHNICARE CORPORATION	05/01/83	630.00

LISTING E

PRINTALL

```
SET FORMAT TO PRINT
@ 1,0 SAY CHR(15)
SET FORMAT TO SCREEN
REPORT FORM PRINTALL TO PRINT
SET FORMAT TO PRINT
@ 1,0 SAY CHR(18)
SET FORMAT TO SCREEN
RETURN
```

PRINTALL.FRM

```
M=0
N
N
Y
N
7,TEST:NO

11,TYPE

10,SERIALNO

15,MODEL

15,CUSTNAM

15,LOCATION

8,DATESTAR
START
8,DATEPROM
PROMISED
8,DATECLOS
CLOSED
9,COST

Y
8,MANHOURS

Y
```

						START	PROMISED	CLOSED		
231204A	CAPACITOR	9047	R. JAHRE	DOBLE ENGINEERING COMPANY	WATERTOWN, MA 02172	06/22/83	10/01/83	08/24/83	486.00	3.00
2312048	VOLTAGE TRANSFORMER	23058	BOSTON MULTIPLE RATIO	DOBLE ENGINEERING COMPANY	WATERTOWN, MA 02172	06/22/83	10/01/83	08/24/83	930.00	0.00
231212	VOLTAGE TRANSFORMER	8346602	TYPE VT-756	KNOFF INC.	EMERYVILLE, CA 94608	08/22/83	/ /	09/25/83	686.00	0.00
231262	WATTHOUR STANDARD			WESTINGHOUSE	RALEIGH, NC 27603	08/31/83	10/03/83	/ /	0.00	0.00
231262A	WATTHOUR STANDARD	D5-1	SINGLEPHASE METER	WESTINGHOUSE	RALEIGH, NC 27603	08/26/83	10/06/83	/ /	0.00	0.00
231262B	WATTHOUR STANDARD	D5-2	SINGLE PHASE METER	WESTINGHOUSE	RALEIGH, NC 27603	08/26/83	10/06/83	/ /	0.00	0.00
231263	VOLTAGE TRANSFORMER	8346731	TYPE KVES VOLTAGE ERROR XFMR	KNOFF INC.	EMERYVILLE,CA 94608	08/22/83	/ /	09/16/83	2469.00	0.00
231267	MAP		SC 10	CLEVELAND ELECTRIC ILLUMINATIN	CLEVELAND, OH 44101	08/31/83	11/07/83	/ /	0.00	0.00
231349	WATTHOUR STANDARD	1914	SC 60 MODEL 6253A	RFL INDUSTRIES INC.	BOONTON, NJ 07005	09/14/83	10/14/83	09/29/83	508.00	0.00
231375	WATTHOUR STANDARD	5227	SC MICROJOULE	MARYLAND PUBLIC SERVICE COMMIS	BALTIMORE, MD	09/15/83	10/08/83	09/29/83	508.00	0.00
231377	MAP		SC-60	NORTHERN STATES POWER COMPANY	MINNEAPOLIS, MN 55403	09/27/83	10/27/83	/ /	0.00	0.00
231378	WATTHOUR STANDARD	1797	SC-60 MODEL 6253	PORTLAND GENERAL ELECTRIC COMP	PORTLAND, OR	09/16/83	10/07/83	/ /	0.00	0.00
231423	MAP			STATE OF CALIFORNIA	SACRAMENTO, CA 95826	09/27/83	11/04/83	/ /	0.00	0.00
231424	MAP		Jo	COLORADO-UTE ASSOCIATION INC.	MONTROSE, CO 81401	09/27/83	11/04/83	/ /	0.00	0.00
231450	MAP		MICROJOULE	TAMPA ELECTRIC	TAMPA, FL 33601	09/27/83	11/07/83	/ /	0.00	0.00
231455	CT COMPARATOR	7015E22	KNOPP COMPARATOR	CONSOLIDATED EDISON COMPANY	NEW YORK, NY 10003	09/02/83	/	/ /	0.00	0.00
844457	CURRENT TRANSFORMER	16a224	GENERAL ELECTRIC JP7	TENNESSEE VALLEY AUTHORITY	CHATTANOOGA, TN 37401		11/01/82	11/01/82	505.00	0.00
844511	DC DIVIDER	8312617	PARK	DEPARTMENT OF THE AIR FORCE	NEWARK AIR STATION, OH 43055		11/01/82	11/01/82	740.00	0.00
844517A	CURRENT TRANSFORMER	14220	P/N 461 TYPE 5	DEPARTMENT OF THE AIR FORCE	NEWARK AIR STATION, OH 43055		11/01/82	11/01/82	1097.00	0.00
844517B	CURRENT TRANSFORMER	8025	P/N 207 TYPE 2	DEPARTMENT OF THE AIR FORCE	NEWARK AIR STATION, OH 43055		11/01/82	11/01/82	0.00	0.00
844539	WATTHOUR STANDARD	8291	SCIENTIFIC COLUMBUS SC-60	TENNESSEE VALLEY AUTHORITY	CHATTANOOGA, TN 37401		12/01/82	12/01/82	1992.00	0.00

LISTING F

PRINTACT

```
REPORT FORM PRINTACT FOR DATECLOS="  " TO PRINT
RETURN
```

PRINTACT.FRM

```
M=1
Y
ACTIVE JOBS
N
N
7,TEST:NO

20,TYPE

30,CUSTNAM

8,DATESTAR
START
8,DATEPROM
PROMISED
```

PRINTOUT F

PAGE NO. 00001
12/15/83

ACTIVE JOBS

			START	PROMISED
0000001	XRAY DIVIDER	KIETHLEY CORP.	09/28/83	/ /
0000002	CURRENT TRANSFORMER	PHILADELPHIA ELECTRIC COMPANY	09/12/83	/ /
0000003	CURRENT TRANSFORMER	PHILADELPHIA ELECTRIC COMPANY	09/12/83	/ /
0000006	MAP	UNIVERSITY OF WISCONSIN	09/27/83	/ /
230988	CURRENT TRANSFORMER	KNOPP INC.	06/16/83	09/23/83
231096	WATTHOUR STANDARD	SCIENTIFIC COLUMBUS	00/00/00	00/00/00
231190	CURRENT TRANSFORMER	GENERAL ELECTRIC COMPANY	00/00/83	09/23/83
231200	CURRENT TRANSFORMER	YOKOGAWA CORP.	08/12/83	09/23/83
231262	WATTHOUR STANDARD	WESTINGHOUSE	08/31/83	10/03/83
231262A	WATTHOUR STANDARD	WESTINGHOUSE	08/26/83	10/06/83
231262B	WATTHOUR STANDARD	WESTINGHOUSE	08/26/83	10/06/83
231267	MAP	CLEVELAND ELECTRIC ILLUMINATIN	08/31/83	11/07/83
231377	MAP	NORTHERN STATES POWER COMPANY	09/23/83	10/27/83
231378	WATTHOUR STANDARD	PORTLAND GENERAL ELECTRIC COMP	09/16/83	10/07/83
231423	MAP	STATE OF CALIFORNIA	09/27/83	11/04/83
231424	MAP	COLORADO-UTE ASSOCIATION INC.	09/27/83	11/04/83
231450	MAP	TAMPA ELECTRIC	09/27/83	11/07/83
231455	CT COMPARATOR	CONSOLIDATED EDISON COMPANY	09/02/83	/ /
G44691	MAP	BONNEVILLE POWER ADMINISTRATIO	09/02/83	10/13/83
G44700A	VOLTAGE TRANSFORMER	NAVAL AIR REWORK FACILITY	09/12/83	10/15/83
G44700B	VOLTAGE TRANSFORMER	NAVAL AIR REWORK FACILITY	09/12/83	/ /

LISTING G

PRINTDEL

```
ERASE
STORE DATE() TO M:DATESTAR
REPORT FORM PRINTDEL FOR (((((M:DATESTAR > DATEPROM) .OR. ;
$(M:DATESTAR,7,2)>$(DATEPROM,7,2)) .AND. ;
DATECLOS=' ') .AND. DATEPROM <> '  /  /  ') .AND.;
DATEPROM <> '0 /  /  ') TO PRINT
RETURN
```

PRINTDEL.FRM

```
M=1
Y
LATE JOBS
N
N
7,TEST:NO

10,STAFF

20,TYPE

30,CUSTNAM

8,DATEPROM
```

PRINTOUT G

PAGE NO. 00001
12/15/83

LATE JOBS

230988	RAMBOZ	CURRENT TRANSFORMER	KNOPP	09/23/83
231096	RAMBOZ	WATTHOUR STANDARD	SCIENTIFIC COLUMBUS	00/00/00
231190	RAMBOZ	CURRENT TRANSFORMER	GENERAL ELECTRIC COMPANY	09/23/83
231200	RAMBOZ	CURRENT TRANSFORMER	YOKOGAWA CORP.	09/23/83
231262	RAMBOZ	WATTHOUR STANDARD	WESTINGHOUSE	10/03/83
231262A	RAMBOZ	WATTHOUR STANDARD	WESTINGHOUSE	10/06/83
231262B	RAMBOZ	WATTHOUR STANDARD	WESTINGHOUSE	10/06/83
231267	RAMBOZ	MAP	CLEVELAND ELECTRIC ILLUMINATIN	11/07/83
231377	RAMBOZ	MAP	NORTHERN STATES POWER COMPANY	10/27/83
231378	RAMBOZ	WATTHOUR STANDARD	PORTLAND GENERAL ELECTRIC COMP	10/07/83
231423	RAMBOZ	MAP	STATE OF CALIFORNIA	11/04/83
231424	RAMBOZ	MAP	COLORADO-UTE ASSOCIATION INC.	11/07/83
231450	RAMBOZ	MAP	TAMPA ELECTRIC	11/07/83
G44691	RAMBOZ	MAP	BONNEVILLE POWER ADMINISTRATIO	10/13/83
G44700A	ANDERSON	VOLTAGE TRANSFORMER	NAVAL AIR REWORK FACILITY	10/15/83

LISTING H

PRINTDEV

```
STORE 'Y' TO X
DO WHILE X='Y'
ERASE
STORE '                          ' TO M:TYPE
@ 1,0 SAY 'DEVICE TYPE' GET M:TYPE
READ
SET HEADING TO &M:TYPE
REPORT FORM PRINTDEV FOR !(M:TYPE)=TYPE TO PRINT
SET HEADING TO
ACCEPT "PRINTOUT FOR OTHER DEVICES 'Y' OR 'N'" TO X1
STORE !(X1) TO X
ENDDO
RETURN
```

PRINTDEV.FRM

```
M=1
N
N
Y
N
7,TEST:NO

15,MODEL

15,CUSTNAM

15,LOCATION

9,COST

Y
8,MANHOURS

Y
```

PRINTOUT H

PAGE NO. 00001 DC DIVIDER
12/15/83

229529	PARK	BIDDLE INSTRUMENTS	BLUE BELL, PA 19422	430.00	0.00
229923	PARK	ROCKWELL INTERNATIONAL	DOWNEY, CA 90241	430.00	0.00
230025	FLUKE MODEL 80E-10	GENERAL ELECTRIC	KING OF PRUSSIA, PA 19406	530.00	0.00
230207	PARK	SANDIA NATIONAL LABORATORIES	ALBUQUERQUE, NM 87185	530.00	0.00
230435	SINGER MODEL PARK	GENERAL ELECTRIC COMPANY	CHAMBLEE, GA 30341	430.00	0.00
230751	HALLMARK	WESTINGHOUSE ELECTRIC	BALTIMORE, MD 21203	430.00	0.00
230771	HALLMARK MODEL PARK	BENDIX CORPORATION	SIDNEY, NY 13838	430.00	0.00
230858	HALLMARK	GENERAL DYNAMICS	FORT WORTH, TX 76101	430.00	0.00
230905		MCDONNELL DOUGLAS	ST. LOUIS, MO 63166	840.00	0.00
230929	ROSS MODEL VD240-6.2-J-K-D M	ROSS ENGINEERING	CAMPBELL, CA 95008	430.00	0.00
230947	HALLMARK	RAYTHEON COMPANY	ANDOVER, MA 01810	430.00	0.00
G44511	PARK	DEPARTMENT OF THE AIR FORCE	NEWARK AIR STATION, OH 43055	740.00	0.00
G44568	SIEFERT	NATIONAL BUREAU OF STANDARDS	WASHINGTON, DC 20234	430.00	0.00
G44660	HALLMARK PVD	DEPARTMENT OF THE ARMY	FT. MONMOUTH, NJ 07703	430.00	0.00
** TOTAL **				6940.00	0.00

LISTING I

PRINTCUS

```
ERASE
SET FORMAT TO PRINT
@ 1,0 SAY CHR(15)
SET FORMAT TO SCREEN
ACCEPT 'CUSTOMER NAME' TO CUST-
SET HEADING TO &CUST
REPORT FORM PRINTCUS FOR !(CUST) = $(CUSTNAM,1,LEN(CUST)) TO
PRINT
SET HEADING TO
SET FORMAT TO PRINT
@ 1,0 SAY CHR(18)
SET FORMAT TO SCREEN
RETURN
```

PRINTCUS.FRM

```
M=1,W=132
N
N
Y
N
7,TEST:NO

20,TYPE

15,MODEL

30,LOCATION

10,STAFF

8,DATEPROM
PROMISED
9,COST

Y
```

PRINTOUT I

PAGE NO. 00001 general electric
12/15/83

					PROMISED	
230025	DC DIVIDER	FLUKE MODEL 80E-10	KING OF PRUSSIA, PA 19406	MISAKIAN	04/10/83	530.00
230219	WATTHOUR STANDARD	GENERAL ELECTRIC I8-10	COMPTON, CA 90220	RAMBOI	03/01/83	1288.00
230308	WATTHOUR STANDARD	GENERAL ELECTRIC TYPE I8-10	SCHENECTADY, NY 12345	RAMBOI	03/01/83	586.00
230475	DC DIVIDER	SINGER MODEL PARK	CHAMBLEE, GA 30341	MISAKIAN	04/01/83	450.00
2304?A	VOLTAGE TRANSFORMER	GENERAL ELECTRIC	LYNCHBURG, VA 24502	ANDERSON	04/01/83	1573.00
2304?B	CAPACITOR	GENERAL RADIO 1404	LYNCHBURG, VA 24502	ANDERSON	04/01/83	760.00
2304?C	CAPACITOR	GENERAL RADIO 1404	LYNCHBURG, VA 24502	ANDERSON	04/01/83	0.00
2304?D	CAPACITOR		LYNCHBURG, VA 24502	ANDERSON	04/01/83	0.00
2305?A	WATTHOUR STANDARD	SANGAMO I8-10	SOMERSWORTH, NH 03873	RAMBOI	05/01/83	1925.00
2305?B	WATTHOUR STANDARD	SCIENTIFIC COLUMBUS SC-s0	SOMERSWORTH, NH 03878	RAMBOI	05/01/83	0.00
2305?C	WATTHOUR STANDARD	SCIENTIFIC COLUMBUS SC-s0	SOMERSWORTH, NH 03878	RAMBOI	05/01/83	0.00
2305?D	WATTHOUR STANDARD	SCIENTIFIC COLUMBUS SC-s0	SOMERSWORTH, NH 03878	RAMBOI	05/01/83	742.00
2?1?50	CURRENT TRANSFORMER	WESTON III	COMPTON, CA 90220	RAMBOI	04/??/83	0.00
** TOTAL **						7837.00

LISTING J

DISPACT

```
REPORT FORM PRINTACT FOR DATECLOS="  "
? '   '
? ' HIT RETURN FOR MENU'
WAIT TO CHOICE
RETURN
```

```
LISTING K

                                        DUP

COPY TO B:CALFY83
RETURN
```

NBS-114A (REV. 2-8C)

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5. AUTHOR(S)

William E. Anderson

6. PERFORMING ORGANIZATION (If joint or other than NBS, see instructions)

NATIONAL BUREAU OF STANDARDS
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WASHINGTON, D.C. 20234

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8. Type of Report & Period Covered

9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP)

10. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

The majority of the calibration customers' concerns are directed not to the technical details of the calibration service but to the timely delivery of that service. It is therefore proper that the calibration services be closely managed. For a Group or Division with a large calibration load, this can be a difficult task. The Applied Electrical Measurements Group of the Electrosystems Division has developed microcomputer-based software to provide considerable assistance to the calibration manager. With this database software, complete information on the status of all the calibration jobs is instantly available.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

calibration management; calibrations; database management; microcomputer; software

13. AVAILABILITY

☐ Unlimited

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